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No. III.

IMPROVED COAST MORTAR.

The SILVER MEDAL *was presented to Capt. T. M.* BAGNOLD, *R.M., of the Wilderness, Saxmundham, Suffolk, for his Improvement in the Coast Mortar in use for Saving the Lives of Persons in cases of Shipwreck.*

The Wilderness, Saxmundham,
July 20, 1841.

SIR,

HEREWITH I transmit you a paper and drawing illustrative of an improvement I have made on the mortar at present in use for saving the lives of shipwrecked persons, and certificate of its practical utility. I will thank you to lay them before the Society; the simplicity of the plan will speak for itself, as I do not think it probable that I shall be able to attend the Society personally.

I am, Sir, &c.
T. M. BAGNOLD.

To the Secretary of the
Society of Arts.

The mortar, &c. used for the above purpose, although generally known as Captain Manby's, was really the proposal of Lieut. Bell of the Royal Artillery, and to him the Society's reward was voted, much about the time of Captain Manby's birth, and Mr. Bell's model being extant in the Society's collection, it may, parhaps, assist the Committee in forming their opinion of my proposed improvement.

The mortar, as sent from the laboratory at Woolwich, is so fitted on its bed that the axis of the bore, is as nearly as possible at an angle of 45° with the horizon, and if it could be always used upon a level platform, this, its true elevation, would be permanent. But, it will be obvious, that when the mortar is carried in haste, either to a sandy or shingle beach, there is no immediate means of ascertaining that it has this due degree of elevation, or that it is (as it ought to be) level in the transverse direction, or in a line at right angles to the direction of the shot; and as all beaches slope more or less rapidly towards the water, this error is of constant, I may say, of invariable occurrence; hence arise two errors in the flight of the projectile, the slope of the beach detracts greatly from the elevation, thereby shortening the range, and the transverse error causes a lateral deviation in the flight of the shot from the line it was intended to take.

In mortar practice from level batteries, the *elevation* of the piece is ascertained by an instrument called the gunner's quadrant, which, by means of a plummet, shews the true angle; then a gunner's spirit-level being applied across the upper surface of the mortar, at the muzzle a small mark is made, corresponding to the centre of the air-bubble. This operation is repeated on the ring near the touch-hole, and a chalk line is struck, connecting these two points, which is technically called *the upper line of metal.* The gunner, standing behind the piece, holds up a plumb-line, and causes the mortar to be trained until the plumb-line in his hand cuts the chalk-line on the gun, and the object to be aimed at; the piece is then ready for firing.

The solid platform remaining level, no further use of instruments is required; but it will be seen, that as the firing upon a sandy or shingly beach moves the position of the gun at every shot, and disturbs the loose materials it stands on, fresh applications of these instruments would be required at each discharge; and the Government, well knowing the impracticability of using them in blowing weather and dark nights, in such exposed situations, have very properly withheld the supply of them.

During the heavy gales of last winter a brig came on shore about a mile below the town of Aldborough, and every effort was made by the coast-guard and beachmen to save the crew. The wreck was barely 200 yards from the beach; the men deceived by the slope, every shot fell short. Increased charges were then tried, the result of which was the regular breaking of the rope at each fire, and the loss of the shot and part of the line.

These circumstances induced me to turn my attention to the subject, and I flatter myself I have succeeded in fitting to the mortar *a simple, cheap, and efficacious means, which, in the first place, enables the most unpractised person to ascertain the true elevation and transverse level of the gun in an instant, even in the darkest night, and to correct them with the greatest ease under any circumstances of the weather or situation.*

My improvement has another very considerable advantage attached to it, viz. as the proper elevation and level can be given to a certainty without the use of instruments, *the upper line of metal, or line of direction, on the gun, becomes* PERMANENT, and is therefore *painted with white upon the piece,* instead of being found and struck each time upon it with chalk; so that the three operations of elevating, levelling, and pointing, are reduced to a single observation, whereby much valuable time is saved where a wreck is in momentary danger of going to pieces, or the sufferers rapidly sinking under cold and exhaustion.

Captain Wheatley, R.N. the Inspecting Commander of the Coast-guard here, is so pleased with the plan, that he is about to apply it to the two other guns under his charge on this coast, and will report in its favour to the Board; if adopted by them, the apparatus will, in future supplies, be fitted at the Arsenal; but to those at present in use it may be applied by any village blacksmith, premising that a gunner's level must be used in the fitting (which might be passed from station to station round the coast in the usual times of communicating); a quadrant may be made by any carpenter, sufficiently accurate for the object in view; indeed, any level would answer the purpose, if fixed for temporary use, as shewn in fig. 3.

The mortar, on its bed, with the wedge in its proper and fixed position, is to be laid on a table, bench, or on the ground, if *nearly* level; the quadrant being applied to the gun, and wedges, stones, or pieces of wood, are to be placed under the *fore* or *hind* part of the bed, as required, until the quadrant shews an elevation of 45°. A chalked plumb-line is next hung down the *side* of the bed, and the perpendicular line struck upon it; this line is to be well cut into the wood, say a quarter of an inch in depth, and of the same width, and the groove painted white. A small iron pendulum, having been previously prepared, is to be hung, by means of a screw driven into the wood, in such a position that its fiducial or chamfered edge should be in a perpendicular position, and close by the side of the groove. The level is next to be applied in the transverse direction of the bed, and the lower side raised as required, as the end was raised in the previous operation; the plummet being hung down the *back part* of the bed, the line is to be struck and cut into the wood, and the pendulum, &c. fixed as before.

Whilst the gun is in this position, the level is to be applied to the muzzle and base-rings, as previously mentioned, and the true upper line of metal being found, is to be *painted* on the mortar.

Fig. 1 shews the mortar on its bed, at an elevation of 45° by its wedge or quoin. The grooves A A and B B, and pendulums C and D, with their guard-irons E E, are shewn at the side and train of the bed. The former of these shews the correct elevation, and the latter proves the painted line F, on the upper surface of the gun, to be in a plane vertical to the horizon, and passing through the axis of the bore. Any deviation from inequality of ground is immediately detected by one or both pendulums.

Fig. 2.

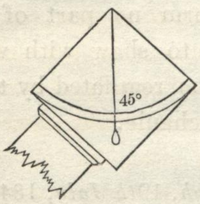
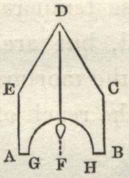


Fig. 3.



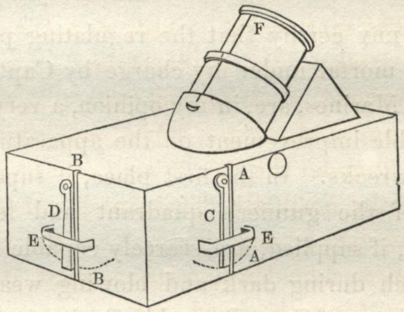


Fig. 1.

Fig. 2 shews a temporary quadrant, made from a rectangular piece of board, the plummet hanging on a line bisecting the arc, whilst one edge of the board being kept against the muzzle of the piece, gives the elevation at 45°.

Fig. 3 shews a temporary level. Let A B C D E be a piece of thin board, and D F a line marked on the board, perpendicular to A B. A semicircular opening being made at the bottom of the board, the points G H are applied to the rings of the gun, and passed right and left (the board being held vertically), until the pointed plummet touches the metal, and its suspending string covers the line D F.

These temporary instruments form no part of the proposal, but are merely inserted to shew with what facility the mortars now in use can be regulated by tools within the reach of the humblest mechanic.

Aldborough, 19*th July*, 1841.

I HEREBY certify that the regulating pendulums affixed to the mortar under my charge by Capt. Bagnold, of the Royal Marines, are, in my opinion, a very simple but considerable improvement on the apparatus for saving men from wrecks. In the first place, it supersedes the necessity of the gunner's quadrant and level, instruments which, if supplied, are scarcely capable of being used on a beach during dark and blowing weather; whilst the pendulums of Capt. Bagnold afford a simple, instantaneous method of ascertaining that the mortar is at the full elevation, and admits of a permanent line being marked on the piece to point it by, and is equally practicable in the dark as in the day-time. Perfectly satisfied with the practical utility of the invention, I shall order it to be applied to two other guns under my charge at Sizewell Gap and Woodbridge Haven.

(Signed) JOHN WHEATLEY,
Commander R.N. Inspecting Commander.